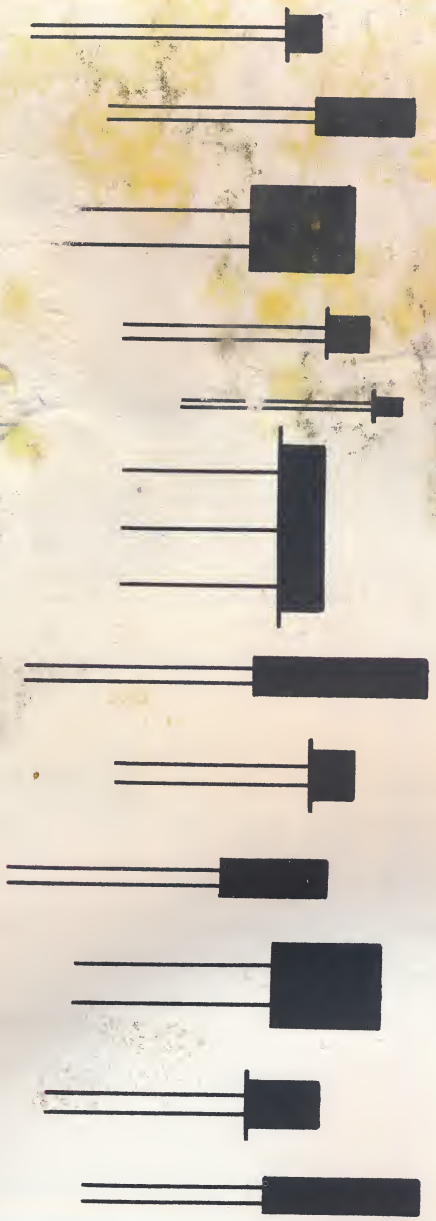

50CL264A

CLAIREX®

PHOTOCONDUCTIVE CELLS

"The Light Touch in Automation and Control"

THE DESIGN ENGINEER will find this publication a useful guide in situations involving light control. Over fifty different types of photoconductive cells, the industry's most complete line, are described with extensive physical and electrical data given for each in both graphical and tabulated forms.

A selection of typical circuit diagrams will also offer some assistance. Although these standard cell types are calculated to suit most needs, special units are developed on request; feel free to consult Clairex or its representatives whenever your particular requirements dictate.

CLAIREX has considered the research, development and manufacture of high quality CdS and CdSe photoconductive cells its sole basis of operation for the last decade. The corporation acquired the title of oldest manufacturer of these cell types as a birthright; its industry-wide reputation as the prime producer of **reliable** light-sensitive components, however, has been **earned** through efficient, creative service to the country's leading companies. Clairex invites you to its facilities the next time you visit New York.

If a special photocell is required, Clairex has eleven years experience designing cells to customer specifications. These have involved many variations on standard cells in Clairex' hermetically sealed packages. Extensive modifications of cells to obtain a desired conductance at a particular light level, unusual voltage ratings, and special sensitive area configurations have also been accomplished.

In some special cases it became necessary to modify the spectral response of the cells to suit a particular design situation. This involved the development of a modified photoconductive material.

Where special cells may be required, consultation is always advisable prior to submission of a detailed cell design for quotation. Such consultation will help assure that the design is within the 'state of the art.'

Occasionally component parts and tooling will exist which are adaptable to a particular special requirement. However, the design engineer would serve his purposes best by attempting to use standard cells wherever possible and thus avoid the delay and expense necessarily involved in any special manufacturing operation.

INTERCHANGEABILITY GUIDE

Clairex' customers will find the 400 series and plastic types of photocells not listed in this manual. Both the 400 and plastic series have been replaced by the 600 series which is electrically identical to both. A 0.5" reduction in overall length of enclosure and a hermetically sealed glass envelope are the only respective physical differences. All delisted cells are still available on request.

DELISTED TYPE	REPLACEMENT
CL402 (S)*	CL602
CL403 (S)*	CL603
CL404 (S)*	CL604
CL405 (S)*	CL605
CL407 (S)*	CL607
CL-2P	CL602
CL-3	CL603
CL-3A	CL603A
CL-4	CL604

*** Side view cells replaced by either the 700 or 900 series.**

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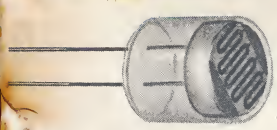
Over 50 Standard Types to suit most Requirements

This listing represents the broadest standard line available in the industry today. Each Cell type carries the CL or CLairex designation followed by three digits. The first digit represents the Series, as shown on the next page, from which the cell package was taken, the second digit is always a separating zero, and the third is the key to the type of standard sensitive material used, as described on the following pages. Any letter following these three digits, and not explained in the footnotes, has been assigned to a material with special response characteristics.

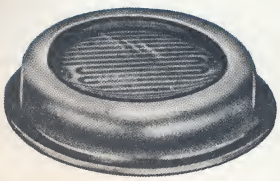
ALL PHOTOS ACTUAL SIZE



'500'

'600'

'700'



'800'

'900'

DUAL ELEMENT

CL Cell #	Sensitive Material	Enclosure (inches)	Pk. Spectral Response, Å	Light Resistance[1]	Voltage Rating (Max.)	Power[4] (MW)
CL503	CdSe	.5x.5	7350	7.2K	250	500-250[2]
CL504	CdSe	.5x.5	6900	1.5K	250	500-250[2]
CL504L	CdSe	.5x.5	6900	0.25K	60	500-250[2]
CL505	CdS	.5x.5	5500	9K	250	500-250[2]
CL505L	CdS	.5x.5	5500	1.5K	60	500-250[2]
CL507	CdS	.5x.5	6150	7.2K	250	500-250[2]
CL602	CdS	.25x.5	5150	1M	300	75
CL603	CdSe	.25x.5	7350	133K	300	75
CL603A	CdSe	.25x.5	7350	75K	300	75
CL603AL	CdSe	.25x.5	7350	3.5K	60	75
CL604	CdSe	.25x.5	6900	30K	300	75
CL604L	CdSe	.25x.5	6900	1.5K	60	75
CL605	CdS	.25x.5	5500	166K	300	75
CL605L	CdS	.25x.5	5500	7.5K	60	75
CL607	CdS	.25x.5	6150	133K	300	75
CL702	CdS	.36x.18	5150	1M	300	125
CL702L	CdS	.36x.18	5150	20K	60	125
CL703	CdSe	.36x.18	7350	133K	300	125
CL703A	CdSe	.36x.18	7350	67K	300	125
CL703L	CdSe	.36x.18	7350	2.7K	60	125
CL704	CdSe	.36x.18	6900	30K	300	125
CL704L	CdSe	.36x.18	6900	.6K	60	125
CL705	CdS	.36x.18	5500	166K	300	125
CL705L	CdS	.36x.18	5500	3.3K	60	125
CL705HL	CdS	.36x.18	5500	28K	60	125
CL707	CdS	.36x.18	6150	133K	300	125
CL707L	CdS	.36x.18	6150	2.7K	60	125
CL802	CdS	1.25x.28	5150	10K	300	2000-500[2]
CL803	CdSe	1.25x.28	7350	1.4K	300	2000-500[2]
CL804	CdSe	1.25x.28	6900	.6K	300	2000-500[2]
CL805	CdS	1.25x.28	5500	1.7K	300	2000-500[2]
CL807	CdS	1.25x.28	6150	1.4K	300	2000-500[2]
CL902	CdS	.21x.15	5150	1M	250	50
CL902N	CdS	.21x.15	5150	500K	75	50
CL903	CdSe	.21x.15	7350	133K	250	50
CL903A	CdSe	.21x.15	7350	67K	250	50
CL903N	CdSe	.21x.15	7350	66K	75	50
CL904	CdSe	.21x.15	6900	30K	250	50
CL904N	CdSe	.21x.15	6900	15K	75	50
CL905	CdS	.21x.15	5500	166K	250	50
CL905N	CdS	.21x.15	5500	83K	75	50
CL907	CdS	.21x.15	6150	133K	250	50
CL907N	CdS	.21x.15	6150	66K	75	50
DUAL ELEMENT CELLS						
CL703/2	CdSe	.36x.18	7350A	50K	300	75-125[3]
CL703L/2	CdSe	.36x.18	7350A	6.5K	60	75-125[3]
CL704/2	CdSe	.36x.18	6900A	17K	300	75-125[3]
CL704L/2	CdSe	.36x.18	6900A	1.5K	60	75-125[3]
CL705/2	CdS	.36x.18	5500A	166K	300	75-125[3]
CL705L/2	CdS	.36x.18	5500A	7.5K	60	75-125[3]
HIGH SPEED "CHOPPER" CELLS (Response Times: Rise <0.4msec, Fall <3.0msec)						
CL703C	CdSe	.36x.18	7350A	50K	250	125
CL703CL	CdSe	.36x.18	7350A	2.3K	60	125
CL903C	CdSe	.21x.15	7350A	50K	250	50

TO-5 Case

TO-18 Case

each element

W/Ne2H Neon

Clairex offers all these characteristics in standard, stock cells:

- Stable and closely controlled Parameters.
- The High Sensitivity and Fast Response of Cadmium Selenide.
- High Ratio of Light to Dark Current at low light levels.
- Low Resistance "L" types for Transistor and other low voltage applications.
- A variety of Spectral Response and Resistance.
- Hermetically Sealed in Glass or Metal-Glass.
- Power Dissipation to two watts, continuous.
- Compact TO-18 and TO-5 packages.

Operating temperature, all types, −50 to +75° C.

[1]Average DC resistance (±33⅓%) measured at 2 foot candles, 2854° K. and 25° C. ambient, from room light history.

[2]With and without heat sink.

[3]Total power dissipation 125 MW. Max. power across one half, 75 MW.

[4]At 25° C. ambient; derated linearly to zero at 75° C.

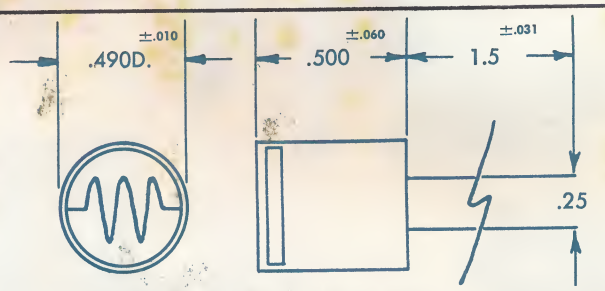
L denotes low resistance — low voltage cell.

C denotes chopper cell.

5 Series . . . in both Metal and Class Packages

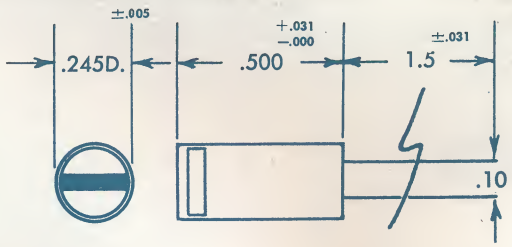
In order to allow for the broadest possible application, five different series of Clairex photoconductive cells have been developed, each in its own unique package of either metal or glass. Each Series contains CdS and CdSe types with widely varied response characteristics, as listed on the following pages.

THE '500' SERIES offers a general purpose end-view hermetically sealed glass enclosure, designed for broad applications. There are 6 types in the Series, particularly useful in areas such as TV brightness controls where direct operation without amplification is desirable. This Series is supplied with individual heat sinks permitting a half watt dissipation with low resistance.



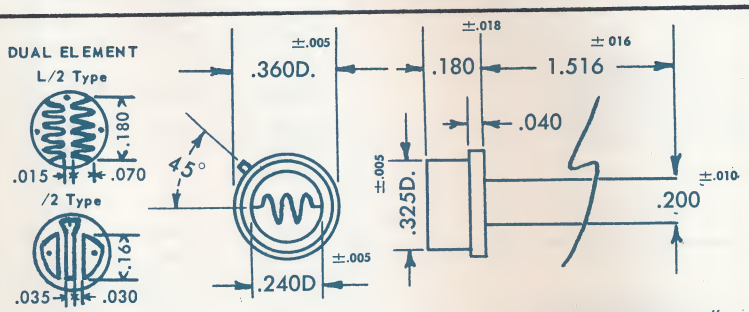
SENSITIVE AREA: STANDARD .34″x.24″, 'L' TYPE .32″x.22″

THE '600' SERIES employs the smallest hermetically sealed glass package with end-view construction. There are 9 types in the Series, with a wide range of electrical characteristics in all 5 sensitive materials. Typical applications are photographic exposure meters and computer tape controls.



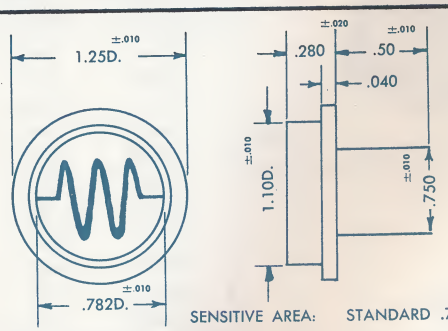
SENSITIVE AREA: STANDARD .04″x.17″, 'L' TYPE .14″x.10″

THE '700' SERIES features a TO-5 metal case allowing up to 125 mw dissipation in free air. There are 14 single element and 6 dual element types available in this series. The widest range of electrical characteristics is offered in this rugged hermetically sealed case. A few of the many applications are photo choppers, automatic exposure controls and photoelectric counters.



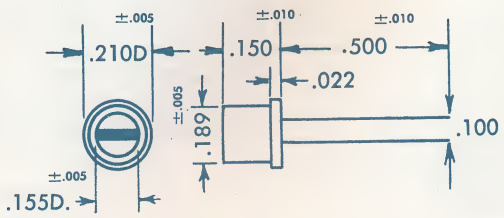
SENSITIVE AREA: STANDARD .05″x.24″, 'L' TYPE .14″x.20″

THE '800' SERIES provides two major advantages: up to two watts dissipation and resistance as low as 58 ohms at one hundred foot candles. There are 5 types in the Series, all of extremely rugged construction. They are particluarly useful in applications requiring high sensitivity such as automatic street light switches.



SENSITIVE AREA: STANDARD .782″ D.

THE '900' SERIES utilizes the smallest hermetically sealed enclosure, a rugged metal TO-18 case. There are 12 types in the Series, particularly useful where critical light beam sensing is a necessity or where space restrictions demand a small size. For this reason, computer input reading devices are a major use area.

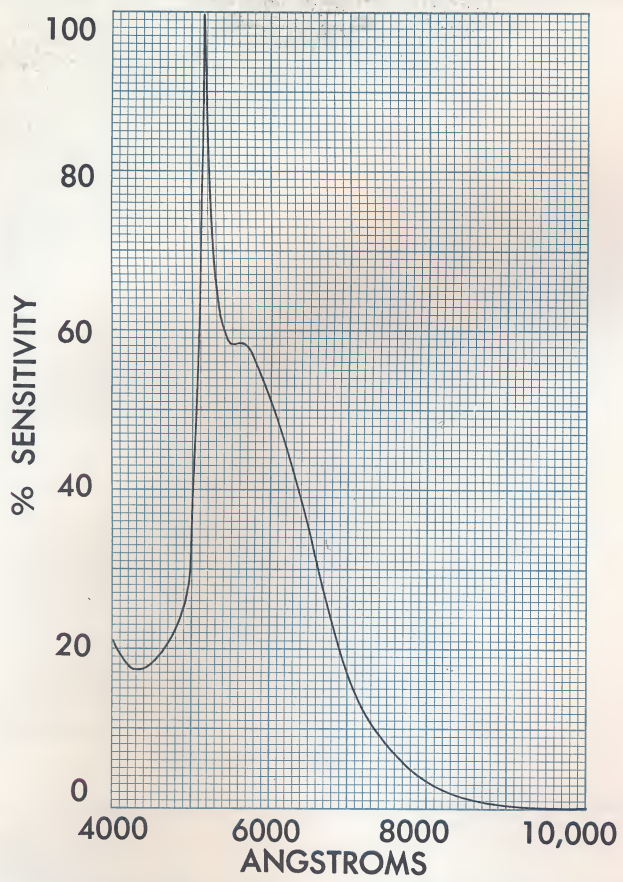


SENSITIVE AREA: STANDARD .13″x.03″, 'N' TYPE .13″x.10″

6 extremely versatile Standard Sensitive Materials

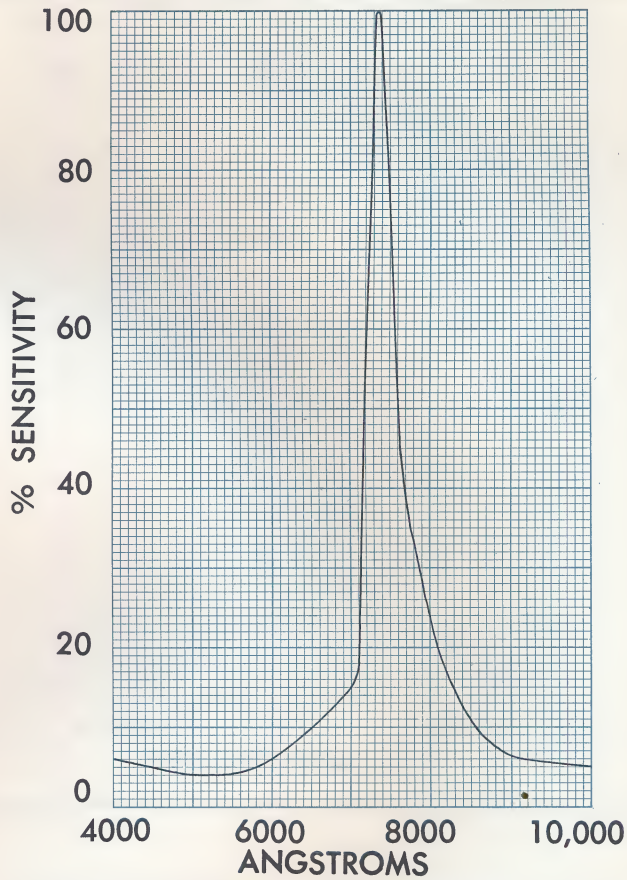
In order to market a line of cells applicable to most situations, Clairex has developed, in addition to special compounds, six standard sensitive materials in CdS and CdSe. These vary in spectral response, sensitivity, speed, temperature and resistance characteristics sufficiently to serve the majority of users. All are described on this and the next two pages.

TYPE 2 of Cadmium Sulfide peaks at 5150 Å. This is Clairex' **most linear** standard material in terms of resistance versus light. It is also the most peaked spectrally. Applications requiring sharp differentiation in the blue-green spectrum such as flame and X-Ray detectors are ideal for this material.



TYPE 3 of Cadmium Selenide peaks at 7350 Å. This is Clairex' **best combination of speed** and **sensitivity.** With a resistance of only 1.4K at 2 foot candles this material has a rise time of .001 seconds to 63% conductance at 100 foot candles from dark.

TYPE 3C of Cadmium Selenide peaks at 7350 Å. This is Clairex' **fastest** material. Developed specifically for photo-electric chopper applications, rise times are guaranteed less than 0.4 msec and fall times less than 3.0 msec with light from a NE2H neon lamp.



RESPONSE TIME VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Response Time (to 1 - 1/e of final reading)					
Rise (seconds)	2.5	.59	.14	.04	.008
Decay (seconds)	.57	.17	.05	.02	.005

CONDUCTANCE VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Temperature °C					
−25°C	46%	110%	116%	110%	92%
0°C	52%	100%	110%	104%	95%
25°C	100%	100%	100%	100%	100%
50°C	97%	102%	102%	101%	98%
75°C	91%	105%	106%	110%	97%

Type 3: **RESPONSE TIME VERSUS LIGHT LEVEL**

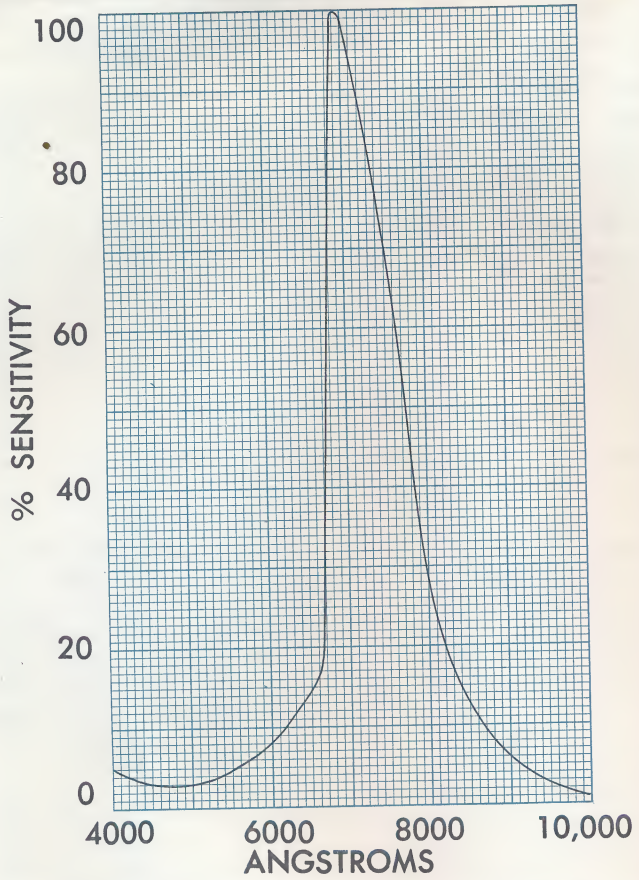
Light Level (Foot Candles)	.01	0.1	1	10	100
Response Time (to 1 - 1/e of final reading)					
Rise (seconds)	.29	.07	.02	.004	.001
Decay (seconds)	.03	.01	.01	.003	.002

CONDUCTANCE VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Temperature °C					
−25°C	600%	340%	200%	130%	120%
0°C	250%	240%	160%	120%	110%
25°C	100%	100%	100%	100%	100%
50°C	55%	28%	52%	71%	83%
75°C	52%	10%	19%	44%	61%

Type 3C: 'ON' resistance increases with temperature. Rise and fall times increase as temperature decreases.

TYPE 4 of Cadmium Selenide peaks at 6900 Å. This is Clairex' **most sensitive** material which, in the 500 Series size has a resistance of only 250 ohms at 2 foot candles. Response time is faster than the CdS materials and temperature sensitivity is greatly reduced over the Type 3 material. It is therefore a combination of maximum light sensitivity with good response time highly useful in direct relay control applications such as burglar alarms.



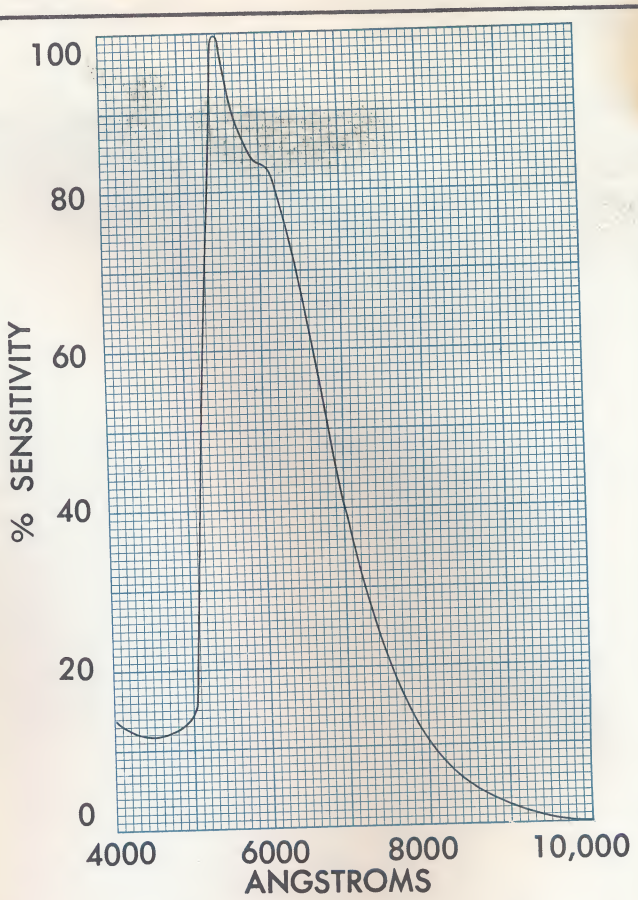
RESPONSE TIME VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Response Time (to 1 - 1/e of final reading)					
Rise (seconds)	1.1	.25	.05	.01	.002
Decay (seconds)	.12	.05	.02	.01	.005

CONDUCTANCE VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Temperature °C					
—25°C	220%	130%	99%	99%	98%
0°C	170%	110%	100%	100%	101%
25°C	100%	100%	100%	100%	100%
50°C	77%	71%	86%	94%	96%
75°C	5%	27%	59%	78%	83%

TYPE 5 of Cadmium Sulfide peaks at 5500 Å. This material **matches** the response of the **human eye.** Its high sensitivity and good temperature characteristics also render it useful for precision light measuring devices. Several fields having applications for this particular sensitive material include light meters, cameras, automatic street light switches and color measuring equipment.



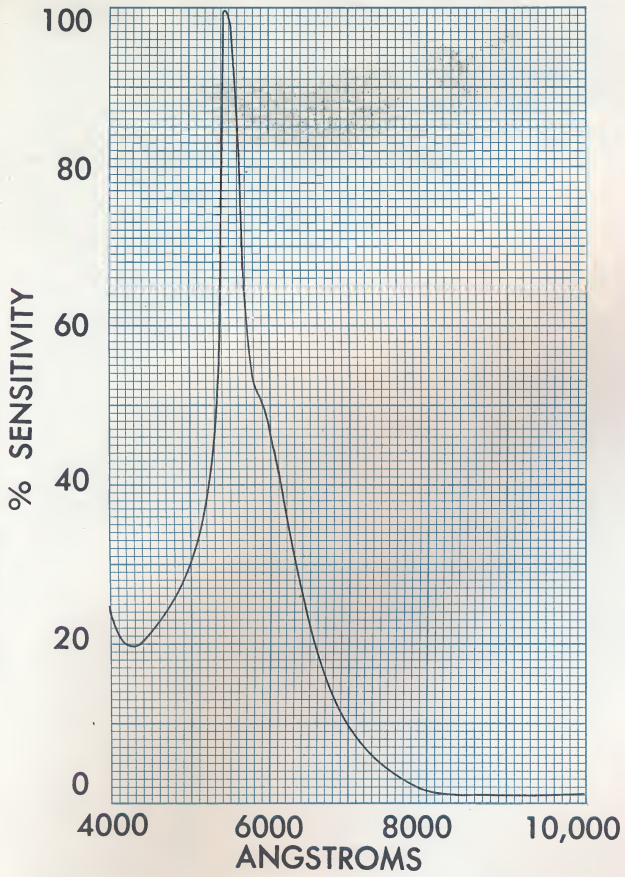
RESPONSE TIME VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Response Time (to 1 - 1/e of final reading)					
Rise (seconds)	2.8	.30	.07	.02	.007
Decay (seconds)	1.3	.22	.06	.02	.014

CONDUCTANCE VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Temperature °C					
—25°C	115%	97%	93%	90%	94%
0°C	103%	97%	95%	94%	96%
25°C	100%	100%	100%	100%	100%
50°C	107%	109%	114%	115%	106%
75°C	114%	126%	131%	138%	105%

TYPE 5H, a modification of Type 5, has been developed for applications requiring a **more linear** response, slope of .9 from .1 to 100 foot candles, or a faster material, 2 msec at 100 foot candles. High speed precision light measurement is a typical application. The excellent temperature characteristics of this material, combined with its speed, also make it a suitable replacement for Cadmium Selenide types in many areas.



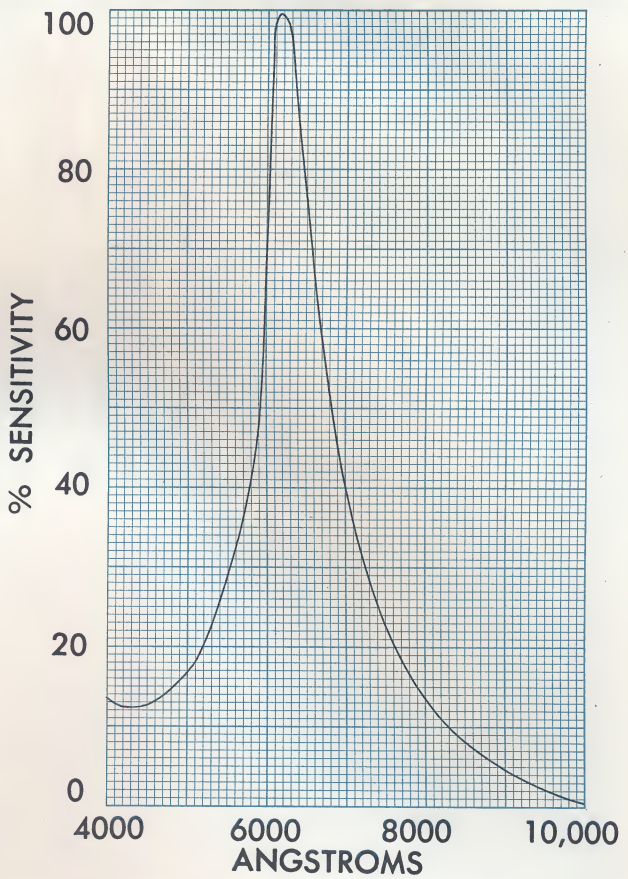
RESPONSE TIME VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Response Time (to 1 - 1/e of final reading)					
Rise (seconds)	0.63	.06	.010	.004	.002
Decay (seconds)	0.17	.02	.004	.002	.001

CONDUCTANCE VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Temperature °C					
−25°C	115%	97%	93%	90%	94%
0°C	103%	97%	95%	94%	96%
25°C	100%	100%	100%	100%	100%
50°C	107%	109%	114%	115%	106%
75°C	114%	126%	131%	138%	105%

TYPE 7 of Cadmium Sulfide peaks at 6150 Å. This material offers an intermediate overall spectral response together with good temperature and resistance characteristics. It is midway between the Sulfide and Selenide materials and thus offers an **overall compromise** on all major material characteristics. Typical areas of application for this material are smoke detectors, meter relays, tilt-angle transducers and bill changers.



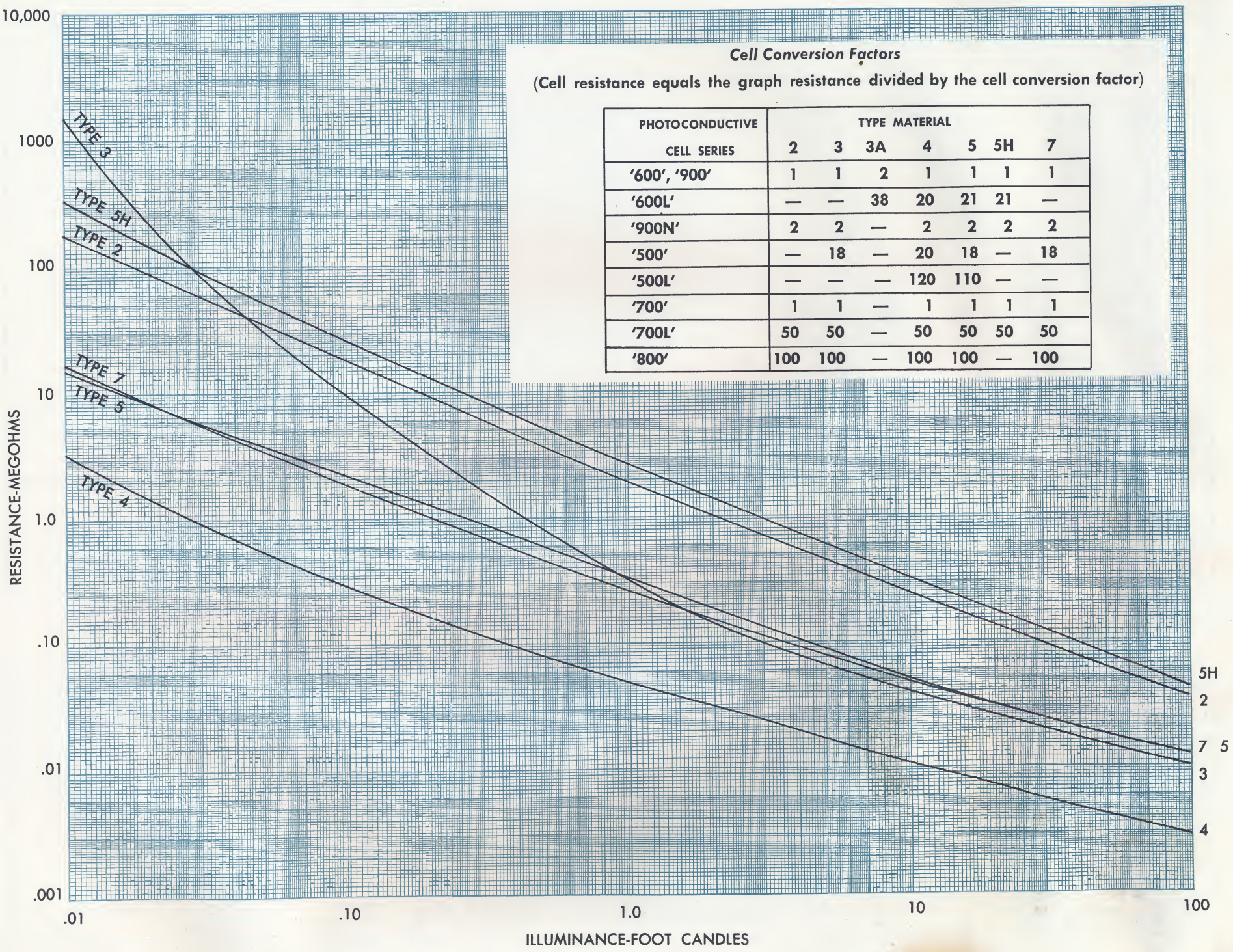
RESPONSE TIME VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Response Time (to 1 - 1/e of final reading)					
Rise (seconds)	1.1	.25	.05	.01	.002
Decay (seconds)	.12	.05	.02	.01	.005

CONDUCTANCE VERSUS LIGHT LEVEL

Light Level (Foot Candles)	.01	0.1	1	10	100
Temperature °C					
−25°C	110%	94%	88%	86%	86%
0°C	111%	99%	97%	98%	95%
25°C	100%	100%	100%	100%	100%
50°C	78%	88%	99%	102%	102%
75°C	52%	74%	93%	104%	99%

CELL RESISTANCE

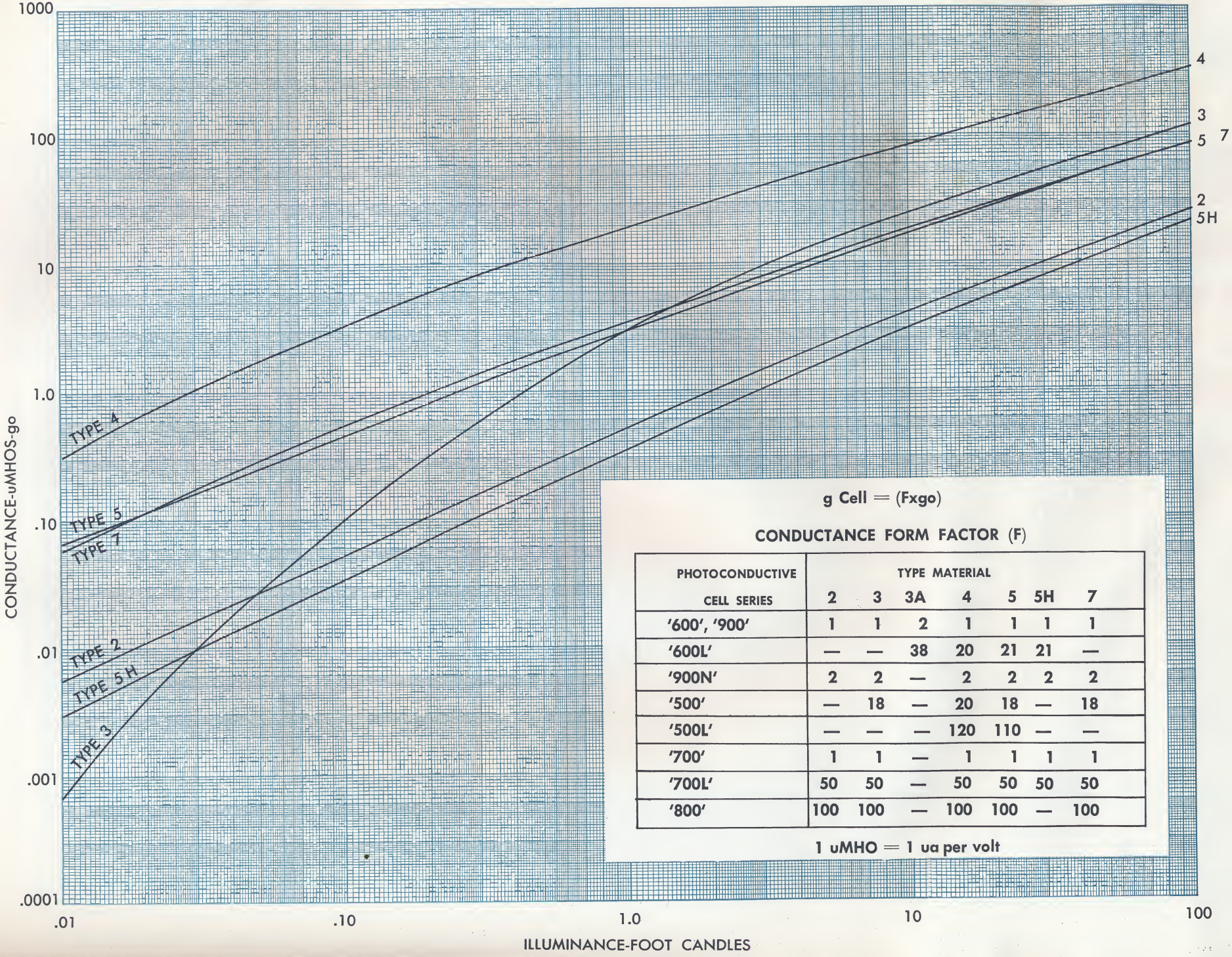


Cell Conversion Factors

(Cell resistance equals the graph resistance divided by the cell conversion factor)

PHOTOCONDUCTIVE CELL SERIES	TYPE MATERIAL 2	3	3A	4	5	5H	7
'600', '900'	1	1	2	1	1	1	1
'600L'	—	—	38	20	21	21	—
'900N'	2	2	—	2	2	2	2
'500'	—	18	—	20	18	—	18
'500L'	—	—	—	120	110	—	—
'700'	1	1	—	1	1	1	1
'700L'	50	50	—	50	50	50	50
'800'	100	100	—	100	100	—	100

CELL CONDUCTANCE



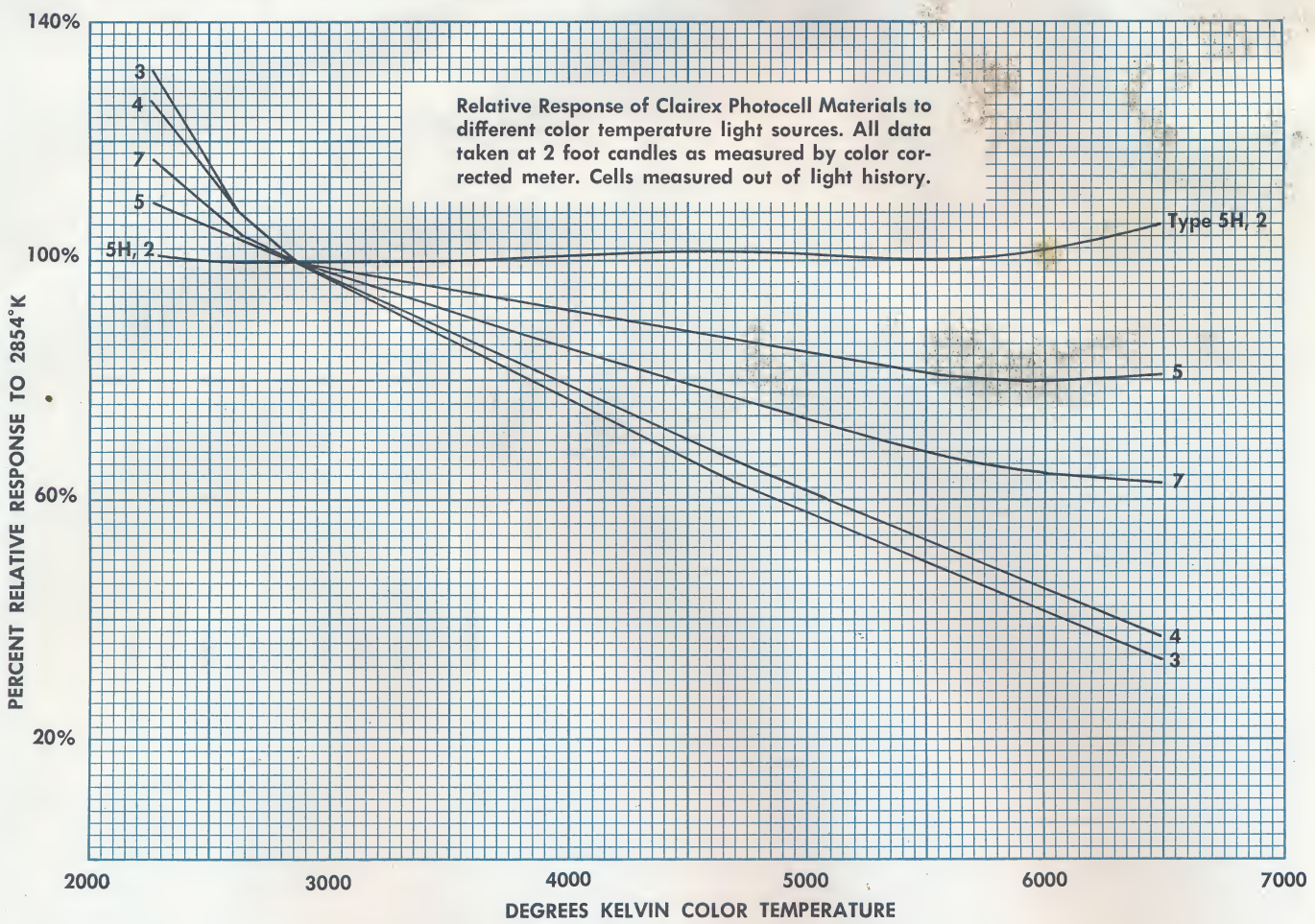
g Cell = (Fxgo)

CONDUCTANCE FORM FACTOR (F)

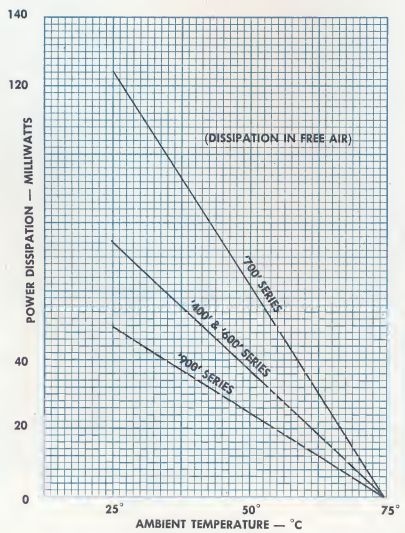
PHOTOCONDUCTIVE CELL SERIES	TYPE MATERIAL 2	3	3A	4	5	5H	7
'600', '900'	1	1	2	1	1	1	1
'600L'	—	—	38	20	21	21	—
'900N'	2	2	—	2	2	2	2
'500'	—	18	—	20	18	—	18
'500L'	—	—	—	120	110	—	—
'700'	1	1	—	1	1	1	1
'700L'	50	50	—	50	50	50	50
'800'	100	100	—	100	100	—	100

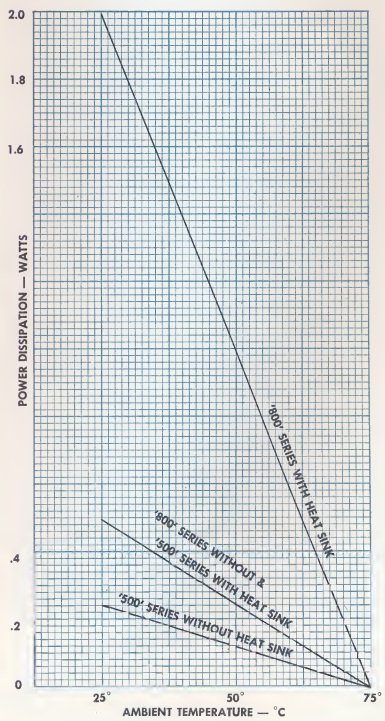
1 uMHO = 1 ua per volt

COLOR TEMPERATURE RESPONSE



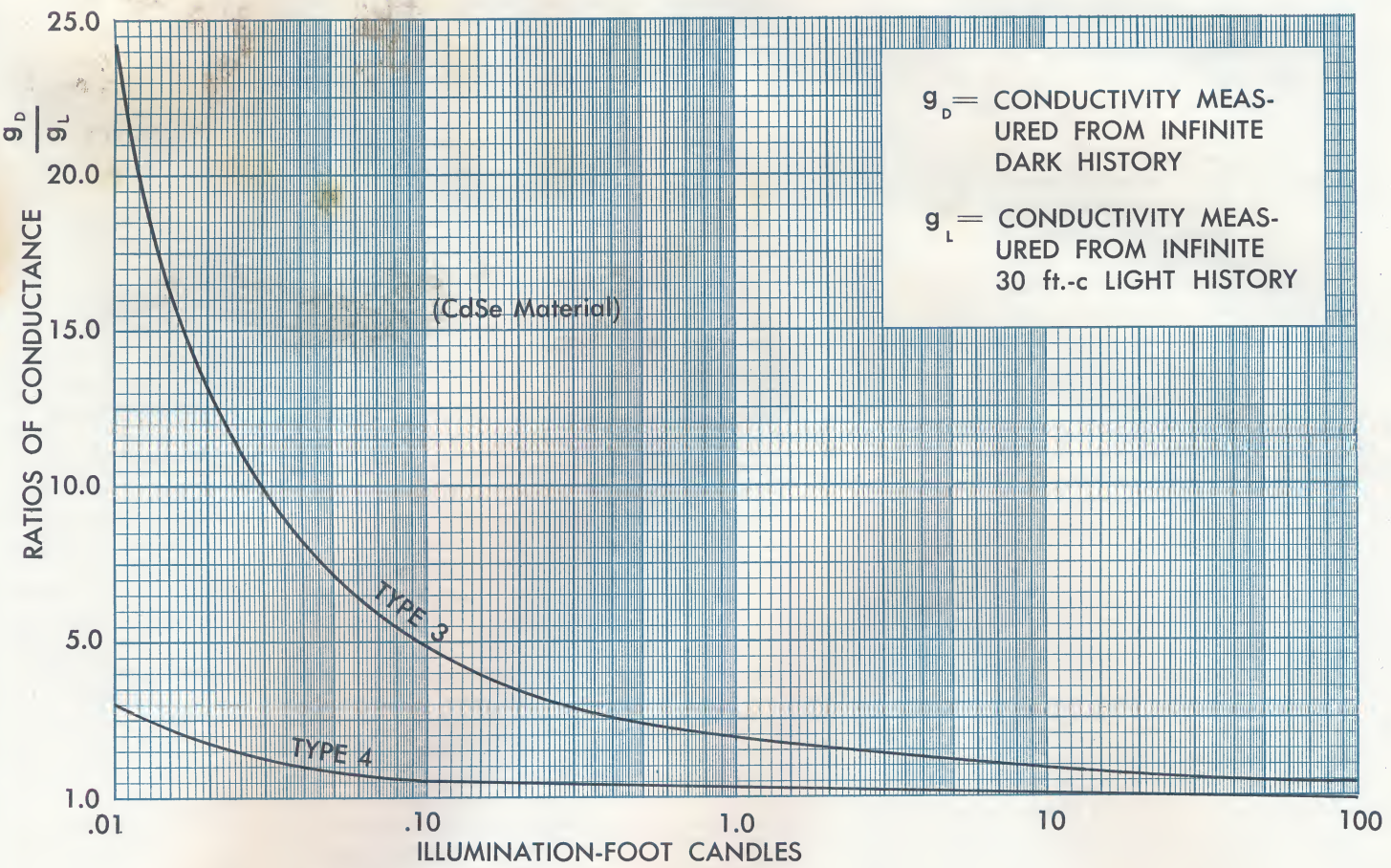
POWER DERATING CURVES

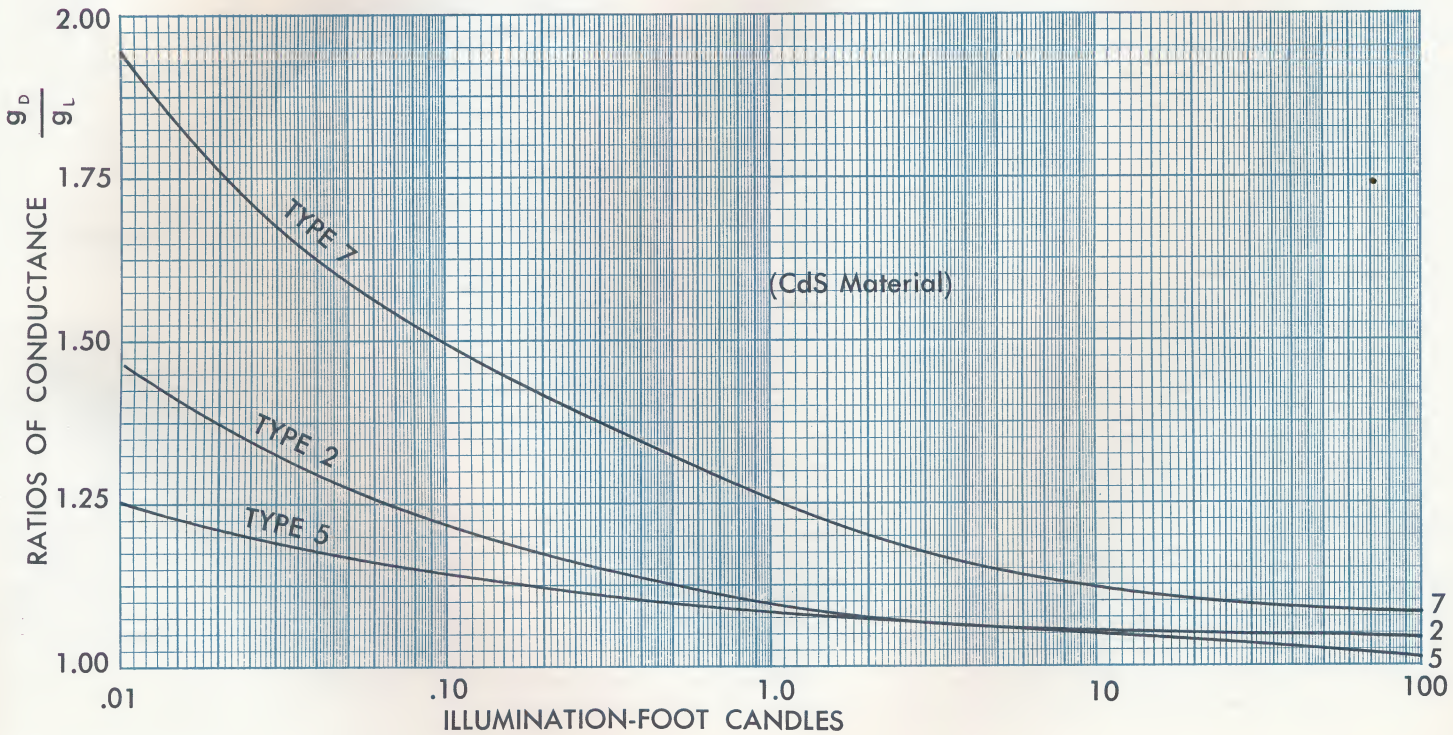




. . . to match Your Design Requirements

VARIATION OF CONDUCTANCE WITH LIGHT HISTORY





Light Measurement and Photosensors . . .

Photometry is a difficult field of precise measurement. The original standard for candle power was a candle of special construction which was observed by the human eye as it burned and then compared to the unknown source. Thus the spectral quality of the light and the sensitivity of the sensor were extremely difficult to reproduce accurately. Today a special lamp has replaced this candle as the primary reference and the human eye has been replaced by thermopiles with filters to simulate eye sensitivity. However, even with these improvements, light measurements remain difficult to reproduce due to stray light effects, color temperature shifts, nonuniform light distribution, drift of sensors, and other circumstances.

In all photometric operations it is necessary for the lamps to be at a known color temperature. Since tungsten lamps have a continuous spectral output their spectral characteristics must be defined in terms of color temperature. For normal work, standard lamps are run at a color temperature of 2854°K.

The secondary standards used today are tungsten lamps which have been carefully measured for their candlepower output at a controlled voltage and current. These standards are available from the National Bureau of Standards as well as several private testing laboratories. Their output is expressed in HCP or Horizontal Candle Power. Output is normally measured in a plane perpendicular to the lamp's vertical axis at a height in line with the filament. Usually the lamp is also marked as to the front and rear sides. With this calibration it is possible to reproduce a variety of illumination levels, by just varying the distance between the photocell and lamp. The foot candles falling on the photocell will equal the HCP of the lamp divided by the square of the distance between them.

$$\frac{HCP}{D^2} = \text{Foot Candles}$$

Whenever possible, it is most desirable to make all light measurements in terms of foot candles as the most easily reproduced unit of light. Whenever foot candle measurements are made, it is important to keep the lamp as far away from the sensor as possible to enable it to act as a point source. A good rule of thumb: maintain a distance of at least six times the longest source dimension.

There are occasions when foot candle measurements are not applicable and brightness measurements are required. For example, if light is reflected from a secondary surface, causing it to be not a point source but an area source. The common unit used to express brightness is the foot lambert. A foot lambert is the brightness of a uniformly diffusing surface reflecting 100% of the light falling on it when illuminated with one foot candle. Therefore, if one foot candle illuminated a surface which had a reflectance of 80%, the brightness of the surface would be .8 foot lambert.

A frequent method of simulating brightness sources is to place a sheet of opal glass between the photocell and lamp. This glass is available calibrated for a conversion factor of foot lamberts on one side of the glass per foot candle illuminating the opposite side.

The above applies to Photoconductive Cells as well as three other major classes of photo-sensors in common use today.

The photo emissive type measures light by the emission in a vacuum of one electron per photon impinging on a metal photo cathode. Photo multipliers having successive stages using secondary emissions are used to amplify the electron current. The photovoltaic type generates a voltage across a pn junction as a function of the photons impinging on it. This class is usually made of Selenium or Silicon and is the only self-generating type, thus requiring no external power supply. The change in junction resistance of photo diodes or photo transistors is also a function of photon energy. The resistance changes are rapid but sensitivity is low.

Photoconductive Cells, as described in this publication, also change resistance with light, however they have no junction limiting their active area. These cells act as light sensitive resistors, with the resistance decreasing with increasing light. Although photoconductors need an external power supply, a sensitivity 1000 times greater than the photovoltaic class more than compensates in most applications. The photoconductor's sensitivity to steady light is 1,000,000 times that of the photo emissive type and equal to the photomultiplier, without the burdensome necessity of a high voltage power supply required by the latter. Photo diodes and transistors have somewhat faster response times than CdS and CdSe photoconductive cells but their inherently poor resistance to light characteristics limit their use to wherever relatively high illumination is available.

CdS and CdSe photoconductive cells therefore represent a significant addition to the photosensor field and a straightforward solution to many design problems through their excellent sensitivity, broad range of spectral response, good temperature characteristics and ease of application with minimum related hardware.

A Useful Tool in your calculations . . .

The nomograph to the right solves the light intensity equation noted previously for both feet and inches. Results are obtained on similar sets of scales, that is, either use all A scales for a calculation, or use the B or C scales as required by the quantities being calculated. For instance, a 20 candlepower lamp is 5 ft. from a photocell. What is the light intensity at the photocell? A line drawn from 20 on the Candlepower scale through the Distance scale, opposite 5 on scale B, intersects the Distance scale opposite 0.80 on the B scale.

Unfortunately, most lamps are classified according to wattage rather than candlepower. The following approximate relationships are useful:

1. Depending upon the application for which they are designed, lamps are rated for lifetimes of seconds to near infinite life. The shorter the rated life, the higher the efficiency (cp/w) and the higher the color temperature of the light.
2. If we restrict ourselves to standard voltage (120v) inside-frosted incandescent lamps rated for 1000 hours, we find that:

Efficiency increases with increasing wattage.

A 25w lamp is near 19 cp, a 60w lamp near 60 cp and a 150w lamp is near 200 cp.

Color temperature increases with increasing wattage.

Color temperature of a 150w lamp is near 2900 Kelvin.

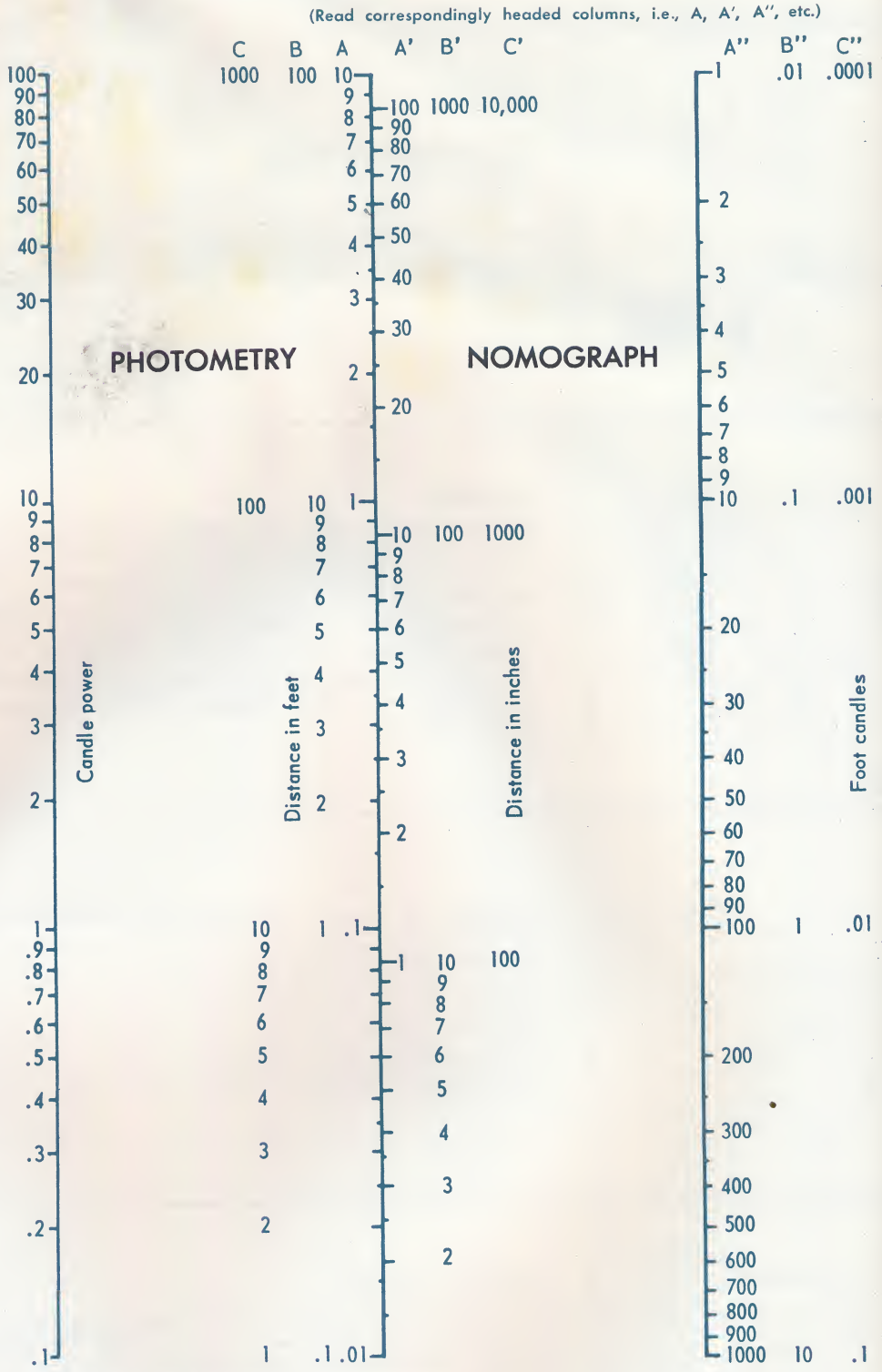
Light output varies at approximately the 3½ power of the supply voltage (near rated voltage).

Lamp life is approximately proportional inversely to the 13th power of the supply voltage (near rated voltage).

When lamps are operated at constant voltage, light output falls with time, rapidly during the first 50 hours, more slowly thereafter (this is the reason for aging photometer lamps).

When lamps are operated at constant current, light output rises with time, slowly at first, then accelerating to catastrophic destruction.

A sample line drawn to the right for a 6 candle power lamp shows that at 2.94" or .245' from the lamp filament we have an intensity of 100 foot candles. Similarly, at 29.4" the intensity is 1 foot candle and at 294", .01 foot candle.



Several useful definitions:

A Foot Candle is the illumination produced when the light from one candle falls normally on a surface at a distance of one foot.

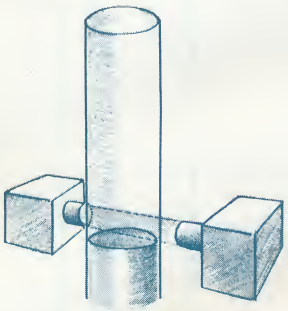
A Lux (commonly used in Europe) is the illumination produced when the light from one candle falls normally on a surface at a distance of one meter.

A point source emiting light uniformly in all directions radiates 4π lumens/candle.

A lambert is the brightness of a perfectly diffusing surface emitting or reflecting one lumen per square centimeter.

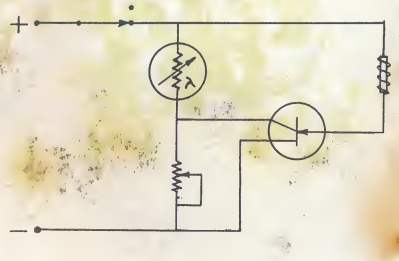
A Foot Lambert equals $1/\pi$ candles/sq. ft.

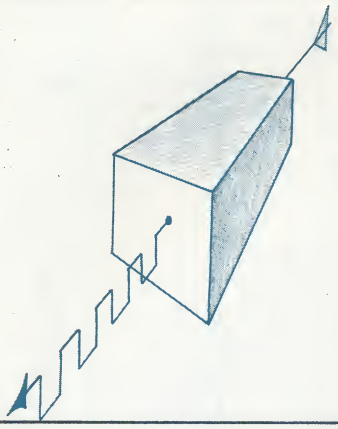
Several typical Circuits . . .



LIGHT-SENSITIVE ALARMS

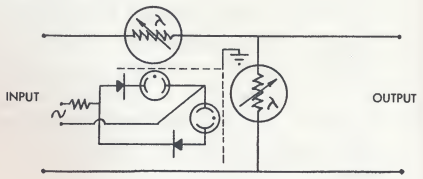
Upon illumination of the photoconductive cell in this circuit, the silicon controlled rectifier fires, tripping the relay. The relay will remain on until the circuit is reset by momentarily opening the switch in the supply line.

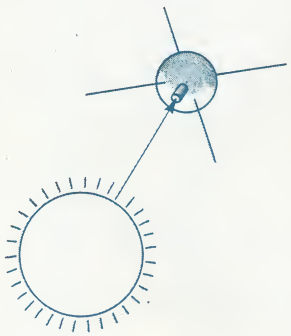




CHOPPERS

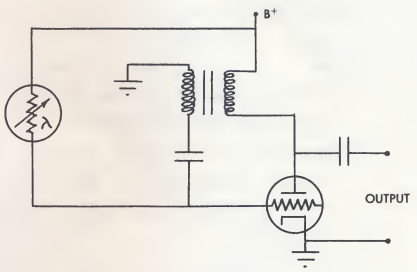
Photoconductive cells now make it possible to replace SPDT mechanical vibrators. The circuit shown converts low level DC to a pulsating signal for AC amplification and may also be used for ultimate synchronous demodulation of the amplified AC if lamps are powered by the same carrier as input chopper. CdSe cells and reasonable source and load impedances can yield chopping efficiencies up to 95% at 60 cps.

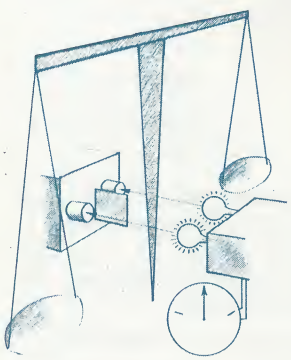




ANALOG TO DIGITAL CONVERTERS

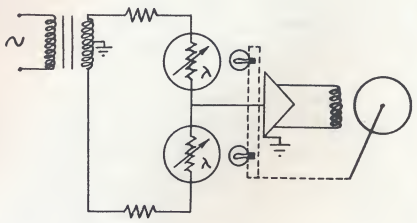
This blocking-oscillator circuit employs a photoconductive cell as the frequency determining grid-leak resistor. The output frequency is a function of the cell illumination. Thus this circuit allows illumination to be measured and translated into digital information for telemetering to remote installations.



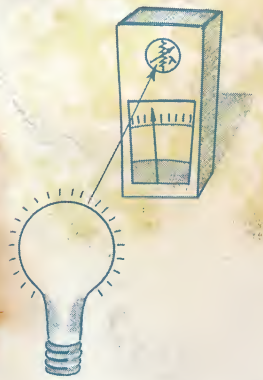


POSITION SERVOS

This circuit illustrates how light beams may be followed through simple servo systems and photoconductive cells used with AC. Unbalanced illumination on the two cells cause the servo motor to move the lamps until illumination is equalized. At this point the motor stops and its position, which can be read remotely, will be a measure of unbalance. This concept has also been used for remote compass readings.

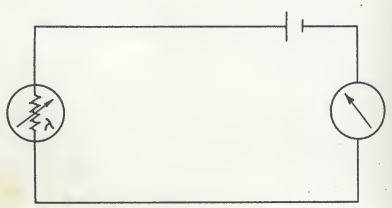


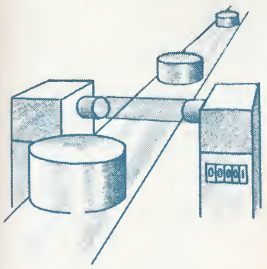
. . . for pre-design consideration



LIGHT METERS

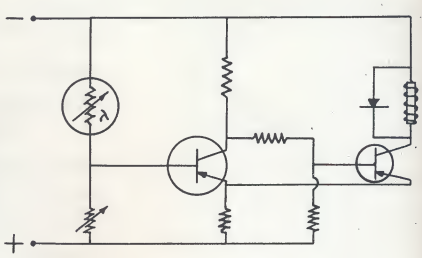
This is the simplest measuring circuit: a photoconductive cell, battery and indicating meter. The use of mercury batteries is advisable for calibration stability. A wide range of operating light levels may be covered by the proper selection of photoconductive cell, voltage, meter and shunt.

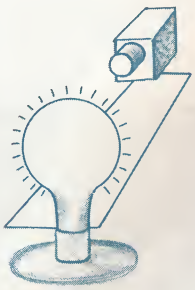




LIGHT SENSITIVE RELAY CONTROLS

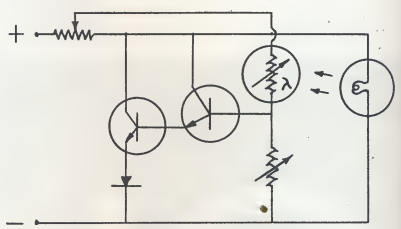
This typical schmitt trigger circuit using a photoconductive cell gives reliable full-ON and full-OFF relay action. Relays can be operated directly from photocells providing the power requirements do not exceed the dissipation ratings of the cells, and the pull-in to drop-out differential is large enough to prevent tripping due to unavoidable stray light.

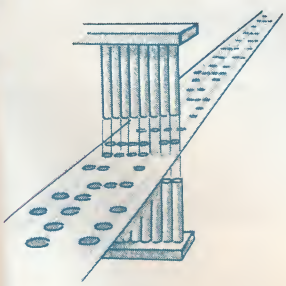




CONSTANT ILLUMINATION SOURCES

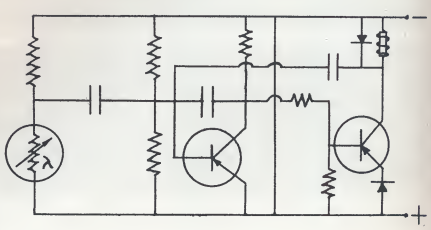
The photoconductive cell in this circuit views the lamp and maintains constant lamp output. The possibility of instability due to lamp-cell response times is minimized since the network is a shunt regulator without voltage gain. The adjustable cell excitation voltage allows optimization of output regulation for input voltage fluctuations.





CARD OR TAPE READERS

This circuit illustrates a monostable multivibrator producing the constant pulse width required by most EDP units for each photoconductive cell illumination regardless of light level or input material opacity variations.



For Additional Information . . .

To order photoconductive cells or obtain technical information, contact the Clairex Corporation directly or your nearest Clairex representative:

New England:
Bordewieck Engineering Sales Co., Phone: 617 VI 3-0845
221 Grove Street, Braintree 84, Mass.

Pennsylvania and East Coast thru Florida:
S. A. Dixon Company Phone: 609 HA 8-3455
P.O. Box 452, Haddonfield, New Jersey

Mid-West:
The Heimann Company Phone: 612 FE 2-5457
1711 Hawthorne Ave., Minneapolis 3, Minn.

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T. B. Hunter Associates Phone: 312 SP 7-2500
5653 W. Irving Pk. Rd., Chicago 34, Ill.

Ohio:
Edmund Frost Phone: 216 831-1442
30650 Pine Tree Road, Cleveland, Ohio

California & Southwest:
Moxon Electronics Corp. Phone: 213 BR 2-9311
2311 Pontius Ave., Los Angeles 64, Calif.

Automotive Field:
Daniel Clifford Phone: 313 TR 5-3544
Room 623, Fisher Bldg., Detroit 2, Michigan

Foreign:
Sylvan Ginsbury, Ltd. Phone: 212 LO 4-7585
8 West 40th St., New York 18, N. Y.

Orders for Clairex standard photoconductive cells listed in this publication may be telephoned into the main office if your local distributor does not stock the cells of your choice. Such orders are usually shipped within 48 hours.

CLAIREX

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